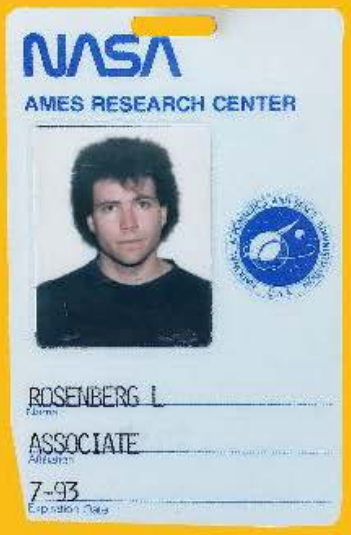
MY DYSLEXIA AND MIXED REALITY INVENTION

DR. LOUIS ROSENBERG TALKS TO Child*Art*

Like millions of people in the world, I am dyslexic. I struggle less today, though dyslexia made my childhood difficult. I could not distinguish between a "b" and a "d" in school. Telling time on a clock face baffled me.

My parents grew worried and took me to see a doctor along with a postcard I had sent them from camp the summer before. While the postcard contained only a few sentences, nearly every word was misspelled. The doctor diagnosed me as dyslexic, saying he could do nothing except hope that my problems would diminish as I grew older.



My problems did not wither away. I had to learn to adapt to the world designed for brains that functioned differently from my own. I struggled to understand anything presented on a flat plane, such as texts, numbers, and clocks. Even today, decades after earning a Ph.D. from Stanford, if you ask me to place a postage stamp on an envelope, I will not remember whether to put it on the left or the right side.

I was biased against flat planes because dyslexia makes the mind's eye work differently. Instead of a fixed perspective looking forward, my brain remembers and imagines everything from all directions at once. Hence, "b" and "d" are the same. That difference only exists because most people's memories are fixed to a flat plane, visualizing letters and numbers constantly from the same direction. I hate flat planes.

In the late 1980s, when the field of virtual reality was born, I was immediately drawn to it. I developed my immersive simulations on the early Silicon Graphics computers that made virtual reality possible. As a Stanford grad student, I researched at NASA in their virtual reality lab,

"My struggles led me to dedicate my life to finding better ways to present information to diverse brains."

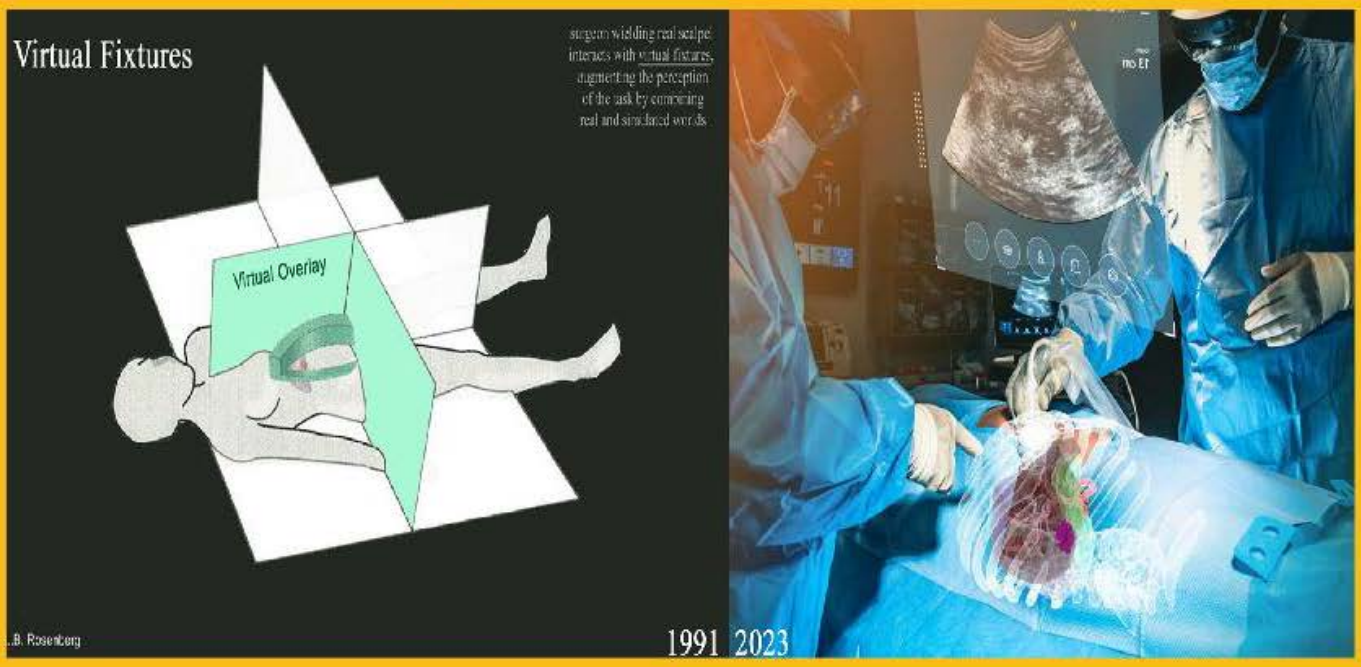
studying how to optimize depth perception in early vision systems and "haptic" interfaces that enable touch. I sought freedom from the flat planes.

But virtual reality cuts you off from your natural surroundings. To free humanity from the plane, I wanted the power of VR to be splashed all over the real world, not confined to simulated worlds you had to enter. With funding from the U.S. Air Force, I built the first system that allows users to reach out and interact with a seamless world of real and virtual objects. Today, we call this "Mixed Reality" or "Augmented Reality." Back then, it had no name. It was just an idea.

It was my dyslexia that led me to the Air Force Research Laboratory to develop a prototype that showed me the future of computing. I can still remember the day that future was revealed. It happened more than thirty years ago in the Human Sensory Feedback Lab at Wright Patterson Air Force Base. I was a young researcher deeply interested in immersive simulations, perceptual psychology, and human-computer interaction. But at that moment, I took off my "researcher hat" and turned myself into a test subject, eager to experience the latest version of my software.

I climbed into a giant exoskeleton covered in sensors, motors, gears, and bearings. Leaning forward, I pressed my face against the eyepieces of a vision system hanging from the ceiling. It used optics cannibalized from binoculars aimed at computer monitors eight feet away, all carefully arranged so an image would appear to float directly in front of me while allowing a natural view of the room, where everything was perfectly aligned in 3D space. This alignment was critical for the system to enable users to reach out and interact with a mixed reality of real and virtual objects, creating an illusion of a single unified experience.

That was the first time I had ever experienced a true mixed reality. In fact, it was likely the first time anyone had. I say that because once you experience the real and virtual combined into a single world your senses perfectly aligned as you reach out and interact with both, the two realms fuse together in your mind. When that happened for me, I was certain that the future of computing would be a seamless merger of the real and the virtual, providing experiences so natural and authentic, it will change our concept of where the real world ends and the digital world begins.


Virtual Fixtures
surgeon wielding real scalpel interacts with virtual fixtures, augmenting the perception of the task by combining real and simulated worlds
Virtual Overlay
L.B. Rosenberg
1991
2023

Imagine if a surgeon could press a button and have 3D virtual structures appear around their patient that looked and felt authentic. The scalpel pressed against these "virtual fixtures" helps guide the motion, preventing the scalpet from cutting too deep or hitting a vital organ. Such a merger of the real and virtual makes surgeons perform faster and more accurately. And the same idea could be used for countless other applications, from scientific research and education, to helping workers repair equipment or creating magical entertainment experiences.

That was three decades ago, and mixed reality technology has made incredible strides over the years, driven by countless engineers, researchers, and inventors making significant breakthroughs along the way. It's been remarkable to watch the field go from a prototype that filled half a room and used nearly a million dollars of hardware to small headsets that now cost around $1,000. In fact, real surgeons are now using mixed reality in live surgeries with great benefit. (See image above).

But this technology is not limited to high-end applications. Apple has released a mixed reality headset to the public that could finally free the whole world from the flat plane. Many other companies, like Google, Meta, and HTC, are also pushing hard. That said, I highlight the Apple headset because their entry into this space will likely transform the public's perspective, showing the world that the magical power of computing will soon be everywhere and anywhere, seamlessly merged into our lives. Some people call this future mixed reality, while others call it the metaverse or extended or augmented reality. It doesn't matter what we call it, the future of computing is coming fast, and it will be all around us.

Dr. Louis Rosenberg obtained his Ph.D. from Stanford and worked for the Air Force Research Laboratory. As a pioneer in VR, AR, and AI technologies, he holds over 300 patents and has founded several successful companies, including Unanimous AI, Immersion Corporation, Microscribe, and Outland Research.